SCOPE OF CLAIMS

1. A wireless communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, with a receiving apparatus having N (N is an integer of 2 or greater), said receiving apparatus comprising:

means for performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas; and

means for demodulating said transmitted signals based on the nulled signals.

2. A wireless communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, with a receiving apparatus having N (N is an integer of 2 or greater), said receiving apparatus comprising:

means for performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas; and

means for calculating and outputting a likelihood for said transmitted signals based on the nulled signals.

3. A wireless communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, with a receiving apparatus having N

(N is an integer of 2 or greater), said receiving apparatus comprising:

means for performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas; and

means for outputting a likelihood for bits of said transmitted signals based on the nulled signals.

4. A wireless communication system according to any one of claims 1 through 3, wherein said means for performing nulling uses a complex conjugate transposed matrix of a Q matrix produced by QR-decomposing the channel matrix as nulling.

5. A wireless communication system according to any one of claims 1 through 3, wherein said transmitted signals are demodulated in a descending order from a transmitted sequence transmitted from an Mth transmitted antenna to a transmitted sequence transmitted from a first transmitted antenna, based on the nulled signals.

6. A wireless communication system according to any one of claims 1 through 5, wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said channel coefficients and outputting a Q matrix and an

R matrix;

a Q^H processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal and said R matrix.

7. A wireless communication system according to any one of claims 1 through 5, wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said channel coefficients and outputting a Q matrix and an R matrix;

a Q^H processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted symbol candidate selector for selecting and outputting a symbol candidate for said converted signal based on said received signals; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said

converted signal, said symbol candidate, and said R matrix.

8. A wireless communication system according to any one of claims 1 through 5, wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a priority determiner for determining priorities between transmission sequences transmitted from said transmission antennas based on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated by said channel coefficient estimator and the priorities determined by said priority determiner, and outputting a modified channel matrix;

a QR decomposer for performing QR decomposition on said modified channel matrix and outputting a Q matrix and an R matrix;

a Q^H processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal and said R matrix; and

a restorer for restoring and outputting at least one of said transmitted sequence, the likelihood for said transmitted sequence, and the likelihood for bits transmitted by said transmitted sequence, based on the

output from said transmitted sequence estimator and said priorities.

9. A wireless communication system according to any one of claims 1 through 5, wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said channel coefficients and outputting a Q matrix and an R matrix;

a Q^H processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is an integer ranging from 1 to M) converted signals based on said received signals and outputting the determined candidate sequences as transmitted sequence candidates; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, and said transmitted sequence candidates.

10. A wireless communication system according to any one of claims 1 through 5, wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said

transmission antennas based on said received signals;

a priority determiner for determining priorities between transmission sequences transmitted from said transmission antennas based on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated by said channel coefficient estimator and the priorities determined by said priority determiner, and outputting a modified channel matrix;

a QR decomposer for performing QR decomposition on said modified channel matrix and outputting a Q matrix and an R matrix;

a Q^H processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted symbol candidate selector for selecting a symbol candidate for a demodulated sequence based on said received signals, and outputting a transmitted symbol candidate;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, and said transmitted symbol candidate; and

a restorer for restoring and outputting at least one of said transmitted sequence, the likelihood for said transmitted sequence, and the likelihood for bits transmitted by said transmitted sequence, based on the output from said transmitted sequence estimator and said priorities.

11. A wireless communication system according to any one of claims

1 through 5, wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a priority determiner for determining priorities between transmission sequences transmitted from said transmission antennas based on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated by said channel coefficient estimator and the priorities determined by said priority determiner, and outputting a modified channel matrix;

a QR decomposer for performing QR decomposition on said modified channel matrix and outputting a Q matrix and an R matrix;

a Q^H processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is an integer ranging from 1 to M) converted signals based on said received signals and outputting the determined candidate sequences as transmitted sequence candidates;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, and said transmitted sequence candidates; and

a restorer for restoring and outputting at least one of said

transmitted sequence, the likelihood for said transmitted sequence, and the likelihood for bits transmitted by said transmitted sequence, based on the output from said transmitted sequence estimator and said priorities.

12. A wireless communication system according to any one of claims 1 through 5, wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said channel coefficients and outputting a Q matrix and an R matrix;

a Q^H processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is an integer ranging from 1 to M) converted signals based on said received signals and outputting the determined candidate sequences as transmitted sequence candidates;

a transmitted symbol candidate selector for selecting and outputting symbol candidates for (M-L) demodulated signals based on said received signals; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, said transmitted sequence candidates, and

said symbol candidates.

13. A wireless communication system according to any one of claims 1 through 5, wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a priority determiner for determining priorities between transmission sequences transmitted from said transmission antennas based on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated by said channel coefficient estimator and the priorities determined by said priority determiner, and outputting a modified channel matrix;

a QR decomposer for performing QR decomposition on said modified channel matrix and outputting a Q matrix and an R matrix;

a Q^H processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is an integer ranging from 1 to M) converted signals based on said received signals and outputting the determined candidate sequences as transmitted sequence candidates;

a transmitted symbol candidate selector for selecting and outputting symbol candidates for (M-L) converted signals based on said received signals;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, and said symbol candidates; and

a restorer for restoring and outputting at least one of said transmitted sequence, the likelihood for said transmitted sequence, and the likelihood for bits transmitted by said transmitted sequence, based on the output from said transmitted sequence estimator and said priorities.

14. A wireless communication system according to any one of claims 6 through 13, wherein said transmitted sequence estimator includes likelihood calculator groups and signal selectors in P stages (P is an integer of 1 or greater);

a likelihood calculator group in a pth (p is an integer ranging from 1 to P) stage comprising Kp (Kp is an integer of 1 or greater) likelihood calculators;

each of said likelihood calculators calculating a likelihood in the pth stage and generating said transmitted symbol candidates based on the converted signal, said R matrix, Lp-1 (Lp-1 is an integer of 1 or greater) error signals output from a signal selector in a (p-1)th stage, and the transmitted symbol candidates; and

a signal selector in the pth stage outputting Lp (Lp is an integer of 1 or greater) maximum likelihoods and Lp transmitted symbol candidates which give the likelihoods, based on Kp likelihoods output from the likelihood calculator group in the pth stage and said transmitted symbol candidates.

15. A wireless communication system according to any one of claims 6 through 13, wherein said transmitted sequence estimator includes likelihood calculator groups and signal selectors in P stages (P is an integer of 1 or greater);

a likelihood calculator group in a pth (p is an integer ranging from 1 to P) stage comprising Kp (Kp is an integer of 1 or greater) likelihood calculators;

each of said likelihood calculators calculating a likelihood in the pth stage and generating said transmitted symbol candidates based on the converted signal, said R matrix, Kp-1 (Kp-1 is an integer of 1 or greater) error signals output from a signal selector in a (p-1)th stage, and the transmitted symbol candidates; and

a signal selector in the pth stage outputting Kp+1 maximum likelihoods and Kp+1 transmitted symbol candidates which give the likelihoods, based on Kp likelihoods output from the likelihood calculator group in the pth stage and said transmitted symbol candidates.

16. A wireless communication system according to any one of claims 6 through 13, wherein said transmitted sequence estimator comprises likelihood calculator groups in M stages (M is an integer of 2 or greater) and signal selector groups in the M stages.

17. A wireless communication system according to any one of claims 6 through 13, wherein said transmitted sequence estimator comprises likelihood calculator groups in N stages (N is an integer of 2 or greater) and signal selector groups in the M stages.

18. A wireless communication system according to any one of claims 6 through 13, wherein said transmitted sequence estimator includes signal selectors in a plurality of stages, and a signal selector in a final stage selects and outputs a most likely transmitted sequence.

19. A wireless communication system according to any one of claims 6 through 13, wherein said transmitted sequence estimator includes signal selectors in a plurality of stages, and a signal selector in a final stage selects a most likely transmitted sequence and outputs a likelihood for said sequence.

20. A wireless communication system according to any one of claims 6 through 13, wherein said transmitted sequence estimator includes signal selectors in a plurality of stages, and a signal selector in a final stage selects a most likely transmitted sequence and outputs a likelihood for a bit sequence transmitted by said sequence.

21. A wireless communication system according to any one of claims 6 through 13, wherein said transmitted sequence estimator includes a likelihood calculator for generating a converted signal replica using elements of said R matrix and calculating the likelihood using a physical quantity measured from said converted signal replica and said received signals.

22. A wireless communication system according to claim 21, wherein said likelihood calculator calculates the likelihood using a squared Euclidean

distance between said received signals and said converted signal replica.

23. A wireless communication system according to claim 21, wherein said likelihood calculator calculates the likelihood using a Euclidean distance converted by performing a given processing operation on a squared Euclidean distance between said received signals and said converted signal replica.

24. A wireless communication system according to any one of claims 7, 10, 12, 13, wherein said transmitted symbol candidate selector employs a linear filter.

25. A wireless communication system according to any one of claims 7, 10, 12, 13, wherein said transmitted symbol candidate selector employs maximum likelihood estimation.

26. A wireless communication system according to any one of claims 8, 10, 11, 13, wherein said priority determiner employs received electric power of each of said transmitted sequences.

27. A wireless communication system according to any one of claims 8, 10, 11, 13, wherein said priority determiner employs a received electric power vs. noise electric power ratio of each of said transmitted sequences.

28. A wireless communication system according to any one of claims 8, 10, 11, 13, wherein said priority determiner employs a received electric

power vs. noise electric power ratio and an interference electric power ratio of each of said transmitted sequences.

29. A wireless communication system according to any one of claims 9, 11, 12, and 13, wherein said transmitted sequence candidate selector employs a linear filter.

30. A wireless communication system according to any one of claims 9, 11, 12, and 13, wherein said transmitted sequence candidate selector employs maximum likelihood estimation.

31. A wireless communication system according to any one of claims 8, 10, 11, 13, wherein data sequences transmitted from M transmission antennas are modulated respectively by independent modulating processes, and said modulating processes have respective different numbers of signal points, and said priority determiner determines said priorities based on said modulating processes for the respective transmission antennas.

32. A wireless communication system according to claim 31, wherein a priority is given to an antenna which has sequences of a lower modulation multi-valued number among said transmission antennas.

33. A wireless communication system according to any one of claims 14 through 20, wherein data sequences transmitted from M transmission antennas are modulated respectively by independent modulating processes, and said modulating processes have respective different numbers of signal

points, and said signal selector determines the number of error signals and transmitted symbol candidates which are output depending on the modulating process for the transmission antenna to be processed by a likelihood calculator in a next stage.

34. A wireless communication system according to any one of claims 6 through 13, wherein said transmitted sequence estimator includes a likelihood calculator for calculating the likelihood using the difference between a squared Euclidean distance between a converted signal replica at a bit 0 and the received signals and a squared Euclidean distance between a converted signal replica at a bit 1 and the received signals.

35. A wireless communication system according to claim 34, wherein said transmitted sequence estimator includes an accumulator for accumulating a first squared Euclidean distance between a converted signal replica at a bit 0 and the received signals and a second squared Euclidean distance between a converted signal replica at a bit 1 and the received signals, and outputting a provisional squared Euclidean distance based on the accumulated squared Euclidean distances; and

wherein said likelihood calculator calculates the likelihood using said provisional squared Euclidean distance if either one of said first and second squared Euclidean distances is not output.

36. A wireless communication system according to claim 34 or 35, wherein said squared Euclidean distance is replaced with a Euclidean distance which is converted by performing a given functional operation on

said squared Euclidean distance.

37. A wireless communication system according to any one of claims 8, 10, 11, 13, wherein data sequences transmitted from M transmission antennas are modulated respectively by independent modulating processes, and said modulating processes have respective independent coding ratios, and said priority determiner determines said priorities based on the coding ratios for the respective transmission antennas.

38. A wireless communication system according to any one of claims 6 through 13, wherein said channel coefficient estimator estimates, in the transmitting apparatus having the M (M is an integer of 2 or greater) transmission antennas, the channel coefficients using pilot symbols periodically transmitted according to a symbol pattern inherent in each of the transmission antennas and known to the receiving apparatus.

39. A wireless communication system according to any one of claims 6 through 13, wherein said transmitting apparatus spreads in advance and then transmits the transmitted signals, and said Q^H processor multiplies the received signal vector having said received signals after being despread as elements by the complex conjugate transposed matrix of said Q matrix and outputs the product as the converted signal.

40. A wireless communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, with a receiving apparatus having N

(N is an integer of 2 or greater), said receiving apparatus comprising:

means for using a Euclidean distance converted by performing a given processing operation on a squared Euclidean distance.

41. A wireless communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, with a receiving apparatus having N (N is an integer of 2 or greater), said receiving apparatus comprising:

an accumulator for accumulating a first squared Euclidean distance at a bit 0 and a second squared Euclidean distance at a bit 1, and outputting a provisional squared Euclidean distance based on the accumulated squared Euclidean distances; and

means for calculating a likelihood using said provisional squared Euclidean distance if either one of said first and second squared Euclidean distances is not output.

42. A wireless communication system according to claim 41, wherein said squared Euclidean distance is replaced with a Euclidean distance which is converted by performing a given functional operation on said squared Euclidean distance.

43. A receiving apparatus having N (N is an integer of 2 or greater) reception antennas in a wireless communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, said receiving apparatus comprising:

means for performing nulling representative of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas; and

means for demodulating said transmitted signals based on the nulled signals.

44. A receiving apparatus having N (N is an integer of 2 or greater) reception antennas in a wireless communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, said receiving apparatus comprising:

means for performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas; and

means for calculating and outputting a likelihood for said transmitted signals based on the nulled signals.

45. A receiving apparatus having N (N is an integer of 2 or greater) reception antennas in a wireless communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, said receiving apparatus comprising:

means for performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission

antennas; and

means for outputting a likelihood for bits of said transmitted signals based on the nulled signals.

46. A receiving apparatus according to any one of claims 43 through 45, wherein said means for performing nulling uses a complex conjugate transposed matrix of a Q matrix produced by QR-decomposing the channel matrix as nulling.

47. A receiving apparatus according to any one of claims 43 through 45, wherein said transmitted signals are demodulated in a descending order from a transmitted sequence transmitted from an Mth transmitted antenna to a transmitted sequence transmitted from a first transmitted antenna, based on the nulled signals.

48. A receiving apparatus according to any one of claims 43 through 47, comprising:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said channel coefficients and outputting a Q matrix and an R matrix;

a Q^H processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal and said R matrix.

49. A receiving apparatus according to any one of claims 43 through 47, comprising:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said channel coefficients and outputting a Q matrix and an R matrix;

a Q^H processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted symbol candidate selector for selecting and outputting a symbol candidate for said converted signal based on said received signals; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said symbol candidate, and said R matrix.

50. A receiving apparatus according to any one of claims 43 through 47, comprising:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a priority determiner for determining priorities between transmission sequences transmitted from said transmission antennas based on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated by said channel coefficient estimator and the priorities determined by said priority determiner, and outputting a modified channel matrix;

a QR decomposer for performing QR decomposition on said modified channel matrix and outputting a Q matrix and an R matrix;

a Q^H processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal and said R matrix; and

a restorer for restoring and outputting at least one of said transmitted sequence, the likelihood for said transmitted sequence, and the likelihood for bits transmitted by said transmitted sequence, based on the output from said transmitted sequence estimator and said priorities.

51. A receiving apparatus according to any one of claims 43 through 47, comprising:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said channel coefficients and outputting a Q matrix and an R matrix;

a Q^H processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is an integer ranging from 1 to M) converted signals based on said received signals and outputting the determined candidate sequences as transmitted sequence candidates; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, and said transmitted sequence candidates.

52. A receiving apparatus according to any one of claims 43 through 47, comprising:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a priority determiner for determining priorities between transmission sequences transmitted from said transmission antennas based on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated by said channel coefficient estimator and the priorities determined by said priority determiner, and outputting a modified channel matrix;

a QR decomposer for performing QR decomposition on said modified channel matrix and outputting a Q matrix and an R matrix;

a Q^H processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted symbol candidate selector for selecting a symbol candidate for a demodulated sequence based on said received signals, and outputting a transmitted symbol candidate;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, and said transmitted symbol candidate; and

a restorer for restoring and outputting at least one of said transmitted sequence, the likelihood for said transmitted sequence, and the likelihood for bits transmitted by said transmitted sequence, based on the output from said transmitted sequence estimator and said priorities.

53. A receiving apparatus according to any one of claims 43 through 47, comprising:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a priority determiner for determining priorities between transmission sequences transmitted from said transmission antennas based on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated by said channel coefficient estimator and the priorities determined by said priority determiner, and outputting a modified channel matrix;

a QR decomposer for performing QR decomposition on said modified channel matrix and outputting a Q matrix and an R matrix;

a Q^H processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is an integer ranging from 1 to M) converted signals based on said received signals and outputting the determined candidate sequences as transmitted sequence candidates;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, and said transmitted sequence candidates; and

a restorer for restoring and outputting at least one of said transmitted sequence, the likelihood for said transmitted sequence, and the likelihood for bits transmitted by said transmitted sequence, based on the output from said transmitted sequence estimator and said priorities.

54. A receiving apparatus according to any one of claims 43 through 47, comprising:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said channel coefficients and outputting a Q matrix and an R matrix;

a Q^H processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is an integer ranging from 1 to M) converted signals based on said received signals and outputting the determined candidate sequences as transmitted sequence candidates;

a transmitted symbol candidate selector for selecting and outputting symbol candidates for (M-L) demodulated signals based on said received signals; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, said transmitted sequence candidates, and said symbol candidates.

55. A receiving apparatus according to any one of claims 43 through 47, comprising:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a priority determiner for determining priorities between transmission sequences transmitted from said transmission antennas based on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated by said channel coefficient estimator and the priorities determined by said priority determiner, and outputting a modified channel matrix;

a QR decomposer for performing QR decomposition on said modified channel matrix and outputting a Q matrix and an R matrix;

a Q^H processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is an integer ranging from 1 to M) converted signals based on said received signals and outputting the determined candidate sequences as transmitted sequence candidates;

a transmitted symbol candidate selector for selecting and outputting symbol candidates for (M-L) converted signals based on said received signals;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, and said symbol candidates; and

a restorer for restoring and outputting at least one of said transmitted sequence, the likelihood for said transmitted sequence, and the likelihood for bits transmitted by said transmitted sequence, based on the output from said transmitted sequence estimator and said priorities.

56. A receiving apparatus according to any one of claims 48 through 55, wherein said transmitted sequence estimator includes likelihood calculator groups and signal selectors in P stages (P is an integer of 1 or greater);

a likelihood calculator group in a pth (p is an integer ranging from 1 to P) stage comprising Kp (Kp is an integer of 1 or greater) likelihood calculators;

each of said likelihood calculators calculating a likelihood in the pth stage and generating said transmitted symbol candidates based on the converted signal, said R matrix, Lp-1 (Lp-1 is an integer of 1 or greater) error signals output from a signal selector in a (p-1)th stage, and the transmitted symbol candidates; and

a signal selector in the pth stage outputting Lp (Lp is an integer of 1 or greater) maximum likelihoods and Lp transmitted symbol candidates which give the likelihoods, based on Kp likelihoods output from the likelihood calculator group in the pth stage and said transmitted symbol candidates.

57. A receiving apparatus according to any one of claims 48 through 55, wherein said transmitted sequence estimator includes likelihood calculator groups and signal selectors in P stages (P is an integer of 1 or greater);

a likelihood calculator group in a pth (p is an integer ranging from 1 to P) stage comprising Kp (Kp is an integer of 1 or greater) likelihood calculators;

each of said likelihood calculators calculating a likelihood in the pth stage and generating said transmitted symbol candidates based on the converted signal, said R matrix, Kp-1 (Kp-1 is an integer of 1 or greater) error signals output from a signal selector in a (p-1)th stage, and the transmitted symbol candidates; and

a signal selector in the pth stage outputting Kp+1 maximum likelihoods and Kp+1 transmitted symbol candidates which give the likelihoods, based on Kp likelihoods output from the likelihood calculator group in the pth stage and said transmitted symbol candidates.

58. A receiving apparatus according to any one of claims 48 through 55, wherein said transmitted sequence estimator comprises likelihood calculator groups in M stages (M is an integer of 2 or greater) and signal selector groups in the M stages.

59. A receiving apparatus according to any one of claims 48 through 55, wherein said transmitted sequence estimator comprises likelihood calculator groups in N stages (N is an integer of 2 or greater) and signal selector groups in the M stages.

60. A receiving apparatus according to any one of claims 48 through 55, wherein said transmitted sequence estimator includes signal selectors in a plurality of stages, and a signal selector in a final stage selects and outputs

a most likely transmitted sequence.

61. A receiving apparatus according to any one of claims 48 through 55, wherein said transmitted sequence estimator includes signal selectors in a plurality of stages, and a signal selector in a final stage selects a most likely transmitted sequence and outputs a likelihood for said sequence.

62. A receiving apparatus according to any one of claims 48 through 55, wherein said transmitted sequence estimator includes signal selectors in a plurality of stages, and a signal selector in a final stage selects a most likely transmitted sequence and outputs a likelihood for a bit sequence transmitted by said sequence.

63. A receiving apparatus according to any one of claims 48 through 55, wherein said transmitted sequence estimator includes a likelihood calculator for generating a converted signal replica using elements of said R matrix and calculating the likelihood using a physical quantity measured from said converted signal replica and said received signals.

64. A receiving apparatus according to claim 63, wherein said likelihood calculator calculates the likelihood using a squared Euclidean distance between said received signals and said converted signal replica.

65. A receiving apparatus according to claim 63, wherein said likelihood calculator calculates the likelihood using a Euclidean distance converted by performing a given processing operation on a squared

Euclidean distance between said received signals and said converted signal replica.

66. A receiving apparatus according to any one of claims 49, 51, 54, 55, wherein said transmitted symbol candidate selector employs a linear filter.

67. A receiving apparatus according to any one of claims 49, 51, 54, 55, wherein said transmitted symbol candidate selector employs maximum likelihood estimation.

68. A receiving apparatus according to any one of claims 50, 52, 53, 55, wherein said priority determiner employs received electric power of each of said transmitted sequences.

69. A receiving apparatus according to any one of claims 50, 52, 53, 55, wherein said priority determiner employs a received electric power vs. noise electric power ratio of each of said transmitted sequences.

70. A receiving apparatus according to any one of claims 50, 52, 53, 55, wherein said priority determiner employs a received electric power vs. noise electric power ratio and an interference electric power ratio of each of said transmitted sequences.

71. A receiving apparatus according to any one of claims 51, 53, 54, 55, wherein said transmitted sequence candidate selector employs a linear

filter.

72. A receiving apparatus according to any one of claims 51, 53, 54, 55, wherein said transmitted sequence candidate selector employs maximum likelihood estimation.

73. A receiving apparatus according to any one of claims 50, 52, 53, 54, wherein data sequences transmitted from M transmission antennas are modulated respectively by independent modulating processes, and said modulating processes have respective different numbers of signal points, and said priority determiner determines said priorities based on said modulating processes for the respective transmission antennas.

74. A receiving apparatus according to claim 73, wherein a priority is given to an antenna which has sequences of a lower modulation multi-valued number among said transmission antennas.

75. A receiving apparatus according to any one of claims 56 through 62, wherein data sequences transmitted from M transmission antennas are modulated respectively by independent modulating processes, and said modulating processes have respective different numbers of signal points, and said signal selector determines the number of error signals and transmitted symbol candidates which are output depending on the modulating process for the transmission antenna to be processed by a likelihood calculator in a next stage.

76. A receiving apparatus according to any one of claims 48 through 55, wherein said transmitted sequence estimator includes a likelihood calculator for calculating the likelihood using the difference between a squared Euclidean distance between a converted signal replica at a bit 0 and the received signals and a squared Euclidean distance between a converted signal replica at a bit 1 and the received signals.

77. A receiving apparatus according to claim 76, wherein said transmitted sequence estimator includes an accumulator for accumulating a first squared Euclidean distance between a converted signal replica at a bit 0 and the received signals and a second squared Euclidean distance between a converted signal replica at a bit 1 and the received signals, and outputting a provisional squared Euclidean distance based on the accumulated squared Euclidean distances; and

wherein said likelihood calculator calculates the likelihood using said provisional squared Euclidean distance if either one of said first and second squared Euclidean distances is not output.

78. A receiving apparatus according to claim 76 or 77, wherein said squared Euclidean distance is replaced with a Euclidean distance which is converted by performing a given functional operation on said squared Euclidean distance.

79. A receiving apparatus according to any one of claims 46, 48, 49, 51, wherein data sequences transmitted from M transmission antennas are modulated respectively by independent modulating processes, and said

modulating processes have respective independent coding ratios, and said priority determiner determines said priorities based on the coding ratios for the respective transmission antennas.

80. A receiving apparatus according to any one of claims 48 through 55, wherein said channel coefficient estimator estimates, in the transmitting apparatus having the M (M is an integer of 2 or greater) transmission antennas, the channel coefficients using pilot symbols periodically transmitted according to a symbol pattern inherent in each of the transmission antennas and known to the receiving apparatus.

81. A receiving apparatus according to any one of claims 48 through 55, wherein said transmitting apparatus spreads in advance and then transmits the transmitted signals, and said Q^H processor multiplies the received signal vector having said received signals after being despread as elements by the complex conjugate transposed matrix of said Q matrix and outputs the product as the converted signal.

82. A receiving apparatus having N (N is an integer of 2 or greater) reception antennas in a wireless communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, said receiving apparatus comprising:

means for using a Euclidean distance converted by performing a given processing operation on a squared Euclidean distance.

83. A receiving apparatus having N (N is an integer of 2 or greater) reception antennas in a wireless communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, said receiving apparatus comprising:

an accumulator for accumulating a first squared Euclidean distance at a bit 0 and a second squared Euclidean distance at a bit 1, and outputting a provisional squared Euclidean distance based on the accumulated squared Euclidean distances; and

means for calculating a likelihood using said provisional squared Euclidean distance if either one of said first and second squared Euclidean distances is not output.

84. A recording apparatus according to claim 83, wherein said squared Euclidean distance is replaced with a Euclidean distance which is converted by performing a given functional operation on said squared Euclidean distance.

85. A demodulating method of receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, in a receiving apparatus having N (N is an integer of 2 or greater) reception antennas, said demodulating method comprising the steps of:

performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission

antennas; and

demodulating said transmitted signals based on the nulled signals.

86. A demodulating method of receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, in a receiving apparatus having N (N is an integer of 2 or greater) reception antennas, said demodulating method comprising the steps of:

performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas; and

calculating and outputting a likelihood for said transmitted signals based on the nulled signals.

87. A demodulating method of receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, in a receiving apparatus having N (N is an integer of 2 or greater) reception antennas, said demodulating method comprising the steps of:

performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas; and

outputting a likelihood for bits of said transmitted signals based

on the nulled signals.

88. A demodulating method according to any one of claims 85 through 87, wherein said step of performing nulling uses a complex conjugate transposed matrix of a Q matrix produced by QR-decomposing the channel matrix as nulling.

89. A demodulating method according to any one of claims 85 through 87, wherein said transmitted signals are demodulated in a descending order from a transmitted sequence transmitted from an Mth transmitted antenna to a transmitted sequence transmitted from a first transmitted antenna, based on the nulled signals.

90. A demodulating method according to any one of claims 85 through 89, wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said channel coefficients and outputting a Q matrix and an R matrix;

a Q^H processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a

likelihood for bits transmitted by said transmitted sequence, based on said converted signal and said R matrix.

91. A demodulating method according to any one of claims 85 through 89, wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said channel coefficients and outputting a Q matrix and an R matrix;

a Q^H processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted symbol candidate selector for selecting and outputting a symbol candidate for said converted signal based on said received signals; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said symbol candidate, and said R matrix.

92. A demodulating method according to any one of claims 85 through 89, wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said

transmission antennas based on said received signals;

a priority determiner for determining priorities between transmission sequences transmitted from said transmission antennas based on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated by said channel coefficient estimator and the priorities determined by said priority determiner, and outputting a modified channel matrix;

a QR decomposer for performing QR decomposition on said modified channel matrix and outputting a Q matrix and an R matrix;

a Q^H processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal and said R matrix; and

a restorer for restoring and outputting at least one of said transmitted sequence, the likelihood for said transmitted sequence, and the likelihood for bits transmitted by said transmitted sequence, based on the output from said transmitted sequence estimator and said priorities.

93. A demodulating method according to any one of claims 85 through 89, wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said

transmission antennas based on said received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said channel coefficients and outputting a Q matrix and an R matrix;

a Q^H processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is an integer ranging from 1 to M) converted signals based on said received signals and outputting the determined candidate sequences as transmitted sequence candidates; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, and said transmitted sequence candidates.

94. A demodulating method according to any one of claims 85 through 89, wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a priority determiner for determining priorities between transmission sequences transmitted from said transmission antennas based on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated by said channel coefficient estimator and the

priorities determined by said priority determiner, and outputting a modified channel matrix;

a QR decomposer for performing QR decomposition on said modified channel matrix and outputting a Q matrix and an R matrix;

a Q^H processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted symbol candidate selector for selecting a symbol candidate for a demodulated sequence based on said received signals, and outputting a transmitted symbol candidate;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, and said transmitted symbol candidate; and

a restorer for restoring and outputting at least one of said transmitted sequence, the likelihood for said transmitted sequence, and the likelihood for bits transmitted by said transmitted sequence, based on the output from said transmitted sequence estimator and said priorities.

95. A demodulating method according to any one of claims 85 through 89, wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a priority determiner for determining priorities between transmission sequences transmitted from said transmission antennas based

on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated by said channel coefficient estimator and the priorities determined by said priority determiner, and outputting a modified channel matrix;

a QR decomposer for performing QR decomposition on said modified channel matrix and outputting a Q matrix and an R matrix;

a Q^H processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is an integer ranging from 1 to M) converted signals based on said received signals and outputting the determined candidate sequences as transmitted sequence candidates;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, and said transmitted sequence candidates; and

a restorer for restoring and outputting at least one of said transmitted sequence, the likelihood for said transmitted sequence, and the likelihood for bits transmitted by said transmitted sequence, based on the output from said transmitted sequence estimator and said priorities.

96. A demodulating method according to any one of claims 85 through 89, wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said channel coefficients and outputting a Q matrix and an R matrix;

a Q^H processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is an integer ranging from 1 to M) converted signals based on said received signals and outputting the determined candidate sequences as transmitted sequence candidates;

a transmitted symbol candidate selector for selecting and outputting symbol candidates for (M-L) demodulated signals based on said received signals; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, said transmitted sequence candidates, and said symbol candidates.

97. A demodulating method according to any one of claims 85 through 89, wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said

transmission antennas based on said received signals;

a priority determiner for determining priorities between transmission sequences transmitted from said transmission antennas based on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated by said channel coefficient estimator and the priorities determined by said priority determiner, and outputting a modified channel matrix;

a QR decomposer for performing QR decomposition on said modified channel matrix and outputting a Q matrix and an R matrix;

a Q^H processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is an integer ranging from 1 to M) converted signals based on said received signals and outputting the determined candidate sequences as transmitted sequence candidates;

a transmitted symbol candidate selector for selecting and outputting symbol candidates for (M-L) converted signals based on said received signals;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, and said symbol candidates; and

a restorer for restoring and outputting at least one of said transmitted sequence, the likelihood for said transmitted sequence, and the

likelihood for bits transmitted by said transmitted sequence, based on the output from said transmitted sequence estimator and said priorities.

98. A demodulating method according to any one of claims 90 through 97, wherein said transmitted sequence estimator includes likelihood calculator groups and signal selectors in P stages (P is an integer of 1 or greater);

a likelihood calculator group in a pth (p is an integer ranging from 1 to P) stage comprising Kp (Kp is an integer of 1 or greater) likelihood calculators;

each of said likelihood calculators calculating a likelihood in the pth stage and generating said transmitted symbol candidates based on the converted signal, said R matrix, Lp-1 (Lp-1 is an integer of 1 or greater) error signals output from a signal selector in a (p-1)th stage, and the transmitted symbol candidates; and

a signal selector in the pth stage outputting Lp (Lp is an integer of 1 or greater) maximum likelihoods and Lp transmitted symbol candidates which give the likelihoods, based on Kp likelihoods output from the likelihood calculator group in the pth stage and said transmitted symbol candidates.

99. A demodulating method according to any one of claims 90 through 97, wherein said transmitted sequence estimator includes likelihood calculator groups and signal selectors in P stages (P is an integer of 1 or greater);

a likelihood calculator group in a pth (p is an integer ranging from 1 to P) stage comprising Kp (Kp is an integer of 1 or greater) likelihood

calculators;

each of said likelihood calculators calculating a likelihood in the pth stage and generating said transmitted symbol candidates based on the converted signal, said R matrix, Kp-1 (Kp-1 is an integer of 1 or greater) error signals output from a signal selector in a (p-1)th stage, and the transmitted symbol candidates; and

a signal selector in the pth stage outputting Kp+1 maximum likelihoods and Kp+1 transmitted symbol candidates which give the likelihoods, based on Kp likelihoods output from the likelihood calculator group in the pth stage and said transmitted symbol candidates.

100. A demodulating method according to any one of claims 90 through 97, wherein said transmitted sequence estimator comprises likelihood calculator groups in M stages (M is an integer of 2 or greater) and signal selector groups in the M stages.

101. A demodulating method according to any one of claims 90 through 97, wherein said transmitted sequence estimator comprises likelihood calculator groups in M stages (M is an integer of 2 or greater) and signal selector groups in the M stages.

102. A demodulating method according to any one of claims 90 through 97, wherein said transmitted sequence estimator includes signal selectors in a plurality of stages, and a signal selector in a final stage selects and outputs a most likely transmitted sequence.

103. A demodulating method according to any one of claims 90 through 97, wherein said transmitted sequence estimator includes signal selectors in a plurality of stages, and a signal selector in a final stage selects a most likely transmitted sequence and outputs a likelihood for said sequence.

104. A demodulating method according to any one of claims 90 through 97, wherein said transmitted sequence estimator includes signal selectors in a plurality of stages, and a signal selector in a final stage selects a most likely transmitted sequence and outputs a likelihood for a bit sequence transmitted by said sequence.

105. A demodulating method according to any one of claims 90 through 97, wherein said transmitted sequence estimator includes a likelihood calculator for generating a converted signal replica using elements of said R matrix and calculating the likelihood using a physical quantity measured from said converted signal replica and said received signals.

106. A demodulating method according to claim 105, wherein said likelihood calculator calculates the likelihood using a squared Euclidean distance between said received signals and said converted signal replica.

107. A demodulating method according to claim 105, wherein said likelihood calculator calculates the likelihood using a Euclidean distance converted by performing a given processing operation on a squared Euclidean distance between said received signals and said converted signal

replica.

108. A demodulating method according to any one of claims 91, 94, 96, 97, wherein said transmitted symbol candidate selector employs a linear filter.

109. A demodulating method according to any one of claims 91, 94, 96, 97, wherein said transmitted symbol candidate selector employs maximum likelihood estimation.

110. A demodulating method according to any one of claims 92, 94, 95, 97, wherein said priority determiner employs received electric power of each of said transmitted sequences.

111. A demodulating method according to any one of claims 92, 94, 95, 97, wherein said priority determiner employs a received electric power vs. noise electric power ratio of each of said transmitted sequences.

112. A demodulating method according to any one of claims 92, 94, 95, 97, wherein said priority determiner employs a received electric power vs. noise electric power ratio and an interference electric power ratio of each of said transmitted sequences.

113. A demodulating method according to any one of claims 93, 95, 96, 97, wherein said transmitted sequence candidate selector employs a linear filter.

114. A demodulating method according to any one of claims 93, 95, 96, 97, wherein said transmitted sequence candidate selector employs maximum likelihood estimation.

115. A demodulating method according to any one of claims 92, 94, 95, 97, wherein data sequences transmitted from M transmission antennas are modulated respectively by independent modulating processes, and said modulating processes have respective different numbers of signal points, and said priority determiner determines said priorities based on said modulating processes for the respective transmission antennas.

116. A demodulating method according to claim 115, wherein a priority is given to an antenna which has sequences of a lower modulation multi-valued number among said transmission antennas.

117. A demodulating method according to any one of claims 98 through 104, wherein data sequences transmitted from M transmission antennas are modulated respectively by independent modulating processes, and said modulating processes have respective different numbers of signal points, and said signal selector determines the number of error signals and transmitted symbol candidates which are output depending on the modulating process for the transmission antenna to be processed by a likelihood calculator in a next stage.

118. A demodulating method according to any one of claims 90

through 97, wherein said transmitted sequence estimator includes a likelihood calculator for calculating the likelihood using the difference between a squared Euclidean distance between a converted signal replica at a bit 0 and the received signals and a squared Euclidean distance between a converted signal replica at a bit 1 and the received signals.

119. A demodulating method according to claim 118, wherein said transmitted sequence estimator includes an accumulator for accumulating a first squared Euclidean distance between a converted signal replica at a bit 0 and the received signals and a second squared Euclidean distance between a converted signal replica at a bit 1 and the received signals, and outputting a provisional squared Euclidean distance based on the accumulated squared Euclidean distances; and

120. A demodulating method according to claim 118 or 119, wherein said squared Euclidean distance is replaced with a Euclidean distance which is converted by performing a given functional operation on said squared Euclidean distance.

121. A demodulating method according to any one of claims 92, 94, 95, 97, wherein data sequences transmitted from M transmission antennas are modulated respectively by independent modulating processes, and said modulating processes have respective independent coding ratios, and said priority determiner determines said priorities based on the coding ratios for the respective transmission antennas.

122. A demodulating method according to any one of claims 90 through 97, wherein said channel coefficient estimator estimates, in the transmitting apparatus having the M (M is an integer of 2 or greater) transmission antennas, the channel coefficients using pilot symbols periodically transmitted according to a symbol pattern inherent in each of the transmission antennas and known to the receiving apparatus.

123. A demodulating method according to any one of claims 90 through 97, wherein said transmitting apparatus spreads in advance and then transmits the transmitted signals, and said Q^H processor multiplies the received signal vector having said received signals after being despread as elements by the complex conjugate transposed matrix of said Q matrix and outputs the product as the converted signal.

124. A demodulating method of receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, in a receiving apparatus having N (N is an integer of 2 or greater) reception antennas, said demodulating method comprising the step of:

using a Euclidean distance converted by performing a given processing operation on a squared Euclidean distance.

125. A demodulating method of receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, in a receiving apparatus having N (N is an integer of 2 or greater) reception antennas, said demodulating method

comprising the steps of:

accumulating a first squared Euclidean distance at a bit 0 and a second squared Euclidean distance at a bit 1, and outputting a provisional squared Euclidean distance based on the accumulated squared Euclidean distances; and

calculating a likelihood using said provisional squared Euclidean distance if either one of said first and second squared Euclidean distances is not output.

126. A demodulating method according to claim 125, wherein said squared Euclidean distance is replaced with a Euclidean distance which is converted by performing a given functional operation on said squared Euclidean distance.

127. A program for a demodulating method of receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, in a receiving apparatus having N (N is an integer of 2 or greater) reception antennas, said program enabling a computer to perform:

a process of performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas; and

a process of demodulating said transmitted signals based on the nulled signals.

128. A program for a demodulating method of receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, in a receiving apparatus having N (N is an integer of 2 or greater) reception antennas, said program enabling a computer to perform:

a process of performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas; and

a process of calculating and outputting a likelihood for said transmitted signals based on the nulled signals.

129. A program for a demodulating method of receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, in a receiving apparatus having N (N is an integer of 2 or greater) reception antennas, said program enabling a computer to perform:

a process of performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas; and

a process of outputting a likelihood for bits of said transmitted signals based on the nulled signals.